

## การฟื้นฟูพื้นที่ป่าชายเลนบริเวณเขตชายฝั่งทะเลจังหวัดระนอง Mangrove Patch Restoration option in the Ranong Coastal Zone

ภูวดล โดยดี<sup>1</sup>  
Puvadol Doydee

### Abstract

Mangroves are found in tropical and subtropical region within areas inundated daily by seawater and are faunally rich with a unique combine of terrestrial and marine organisms. The study focused on the Ranong mangrove ecosystem where the mangrove biosphere reserve site is located and coastal area was encroached by the tsunami in 2004. This paper describes the important of mangrove dominant species in each patch as option to be planted for mangrove reforestation. Six study sites were selected based on remotely sensed data (Landsat-5 TM) for preliminary selecting the areas and actual field survey considering on accessibility, patch size and associated elements such as channels and routes. The Point Centered Quarter (PCQ) method was used to determine the mangrove trees species and the dominant species. There were 19 mangrove trees species and revealed 7 dominant species, selected from each site namely: *Rhizophora apiculata*, *R. mucronata*, *Avicennia marina*, *A. officinalis*, *Ceriops decandra*, *C. tagal* and *Bruguiera paviflora*. Those dominant species were recommended for planting in Ranong coastal zone to increase the biodiversity habitat for coastal fauna. Eventually, this option will improve the quality of life for the people.

### บทคัดย่อ

ป่าชายเลนเป็นสังคมพืชที่พบในเขตร้อนและเขตอบอุ่น บริเวณที่มีการขึ้นลงของน้ำทะเล เป็นพื้นที่ที่มีสัตว์หลากหลายชนิดอาศัยอยู่ด้วยกัน มีเอกลักษณ์เฉพาะคือ จะพบทั้งสิ่งมีชีวิตจากบกและจากทะเลผสมกัน การศึกษาในครั้งนี้ได้เลือกพื้นที่ป่าชายเลนจังหวัดระนองเพราะเป็นพื้นที่สงวนชีวมณฑลด้านทรัพยากรชายฝั่งและเป็นจังหวัดที่เคยได้รับผลกระทบจากคลื่นสึนามิในปี พ.ศ. 2547 การศึกษานี้อธิบายถึงความสำคัญของไม้ชายเลนชนิดเด่น เพื่อใช้เป็นแนวทางในการฟื้นฟูป่าชายเลน พื้นที่ศึกษาทั้ง 6 พื้นที่ได้ถูกเลือกจากข้อมูลภาพถ่ายดาวเทียมและการสำรวจข้อมูลภาคสนามโดยพิจารณาจากการเข้าถึง ขนาด และองค์ประกอบอื่น ๆ เช่น ลำคลองและเส้นทางในพื้นที่ศึกษา วิธีการวิจัยโดยเทคนิค Point Centered Quarter (PCQ) ได้ถูกนำมาประยุกต์ใช้เพื่อศึกษาวิเคราะห์จำนวนชนิดของไม้ชายเลนและไม้ชายเลนชนิดเด่น ผลการศึกษาพบว่าบริเวณพื้นที่ศึกษาที่มีไม้ชายเลนอยู่ทั้งสิ้น 19 ชนิดและเป็นชนิดเด่น 7 ชนิด ได้แก่ โกงกางใบเล็ก โกงกางใบใหญ่ แสมทะเล แสมดำ ไปรงขาว ไปรงแดง และถั่วดำ โดยไม้ชายเลนชนิดเด่นเป็นชนิดที่เหมาะสมสำหรับการปลูกเพิ่มเติมในพื้นที่ เพื่อทำการฟื้นฟูทรัพยากรชายฝั่งทะเลจังหวัดระนอง ประโยชน์ที่เกิดจากการเพิ่มขึ้นของพื้นที่ป่าชายเลนคือสัตว์ชนิดต่าง ๆ จะมีแหล่งที่อยู่อาศัยและหากินเพิ่มขึ้น ทำให้ความหลากหลายทางชีวภาพเพิ่มขึ้น ก่อให้เกิดความสมดุลของระบบนิเวศชายฝั่งทะเล แล้วท้ายที่สุดเมื่อความอุดมสมบูรณ์ของทรัพยากรธรรมชาติฟื้นคืนมา ราษฎรในพื้นที่ก็จะมีความเป็นอยู่ที่ดีขึ้น

**Key words:** mangroves, restoration, coastal zone

**คำสำคัญ:** ป่าชายเลน การฟื้นฟู เขตชายฝั่งทะเล

### Introduction

Mangroves in coastal areas play a key role as essential habitats for many commercially important aquatic fauna along tropical coastal. They dominated by several species of trees, shrubs and herbs capable of growth and reproduction in areas inundated daily by seawater (Aksornkoae *et al.*, 1992; Smith and Smith, 2004; Doydee

<sup>1</sup> ภาควิชาการจัดการประมง คณะประมง มหาวิทยาลัยเกษตรศาสตร์ ลาดยาว จตุจักร กรุงเทพฯ 10900

*et al.*, 2008). They contribute to habitat complexity and the diversity of the associated fauna of the coastal ecosystem (Othman, 1994; Lee, 1998). They also provide important indirect services such as shoreline stability and water quality (Buot, 1994; Janssen and Padilla, 1999; Anongponyoskun and Doydee, 2006). Furthermore, they provide suitable areas for breeding and serving as nursery ground for many fish and shellfish species (Sasekumar *et al.*, 1992; Barbier and Strand, 1998).

However, they are under severe environmental problem as the areas have been fragmented resulting from human activities and natural disaster (Field, 1996; Macintosh *et al.*, 2002; Ashton *et al.*, 2003). The mangroves destruction is common especially in Southeast Asian countries, including Thailand. The Ranong mangroves are fragmented due to population growth, conversion to aquaculture, agriculture, coastal urban and tourism and industrial development (Ong, 1995; Macintosh, 1996). On December 26, 2004, a tsunami hit the Andaman Sea Coast of Ranong causing severe damages to life and property as well as the vast edge of mangrove areas were destroyed.

Healthy mangroves can mitigate the negative impact of tsunami commonly ravaging the coast. In Ranong, many villages were saved from tsunami because of the dense growth of mangrove along the shoreline as reported by Chotthong and Aksornkoae (2007). Thus, mangroves serve as life-saving belts to help filter the energy of strong winds and tidal waves (Harakunarak and Aksornkoae, 2005).

Mangrove patch restoration in the fragmented areas or between the patches of mangrove forests could be the best option to increase the mangrove areas which will be the benefits not only for coastal flora and fauna but for the local people as well. The objectives of this study were to inventory the mangrove trees species in the Ranong coastal zone and to recommend appropriate species to be planted in the mangrove landscape of Ranong, Thailand.

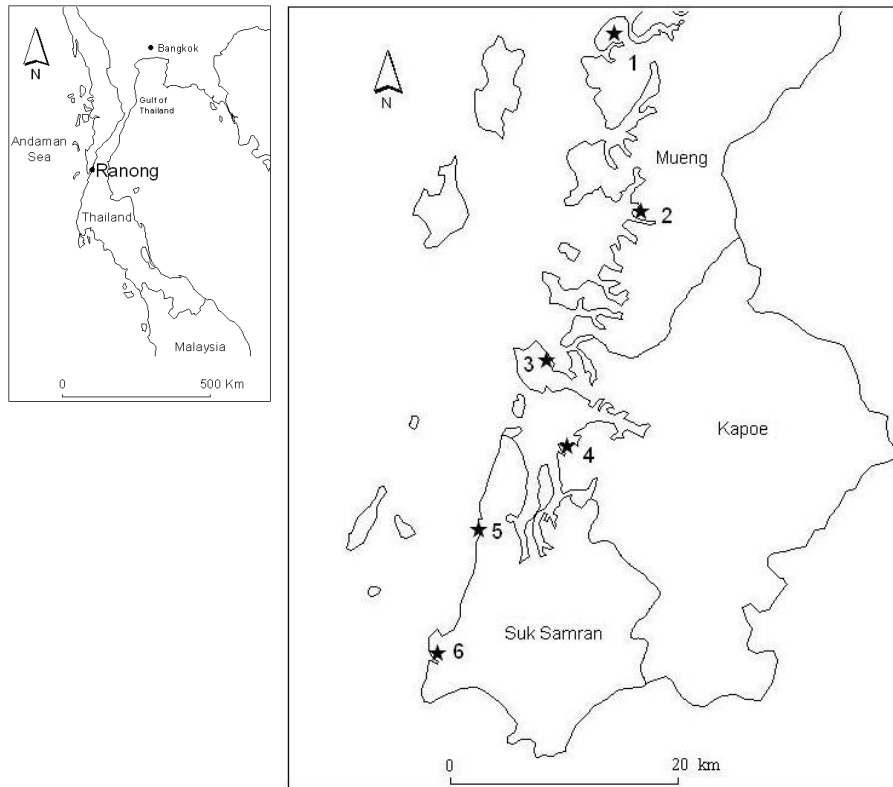
## Materials and Methods

The study was conducted in Ranong, Thailand ( $9^{\circ}43'N$  to  $9^{\circ}57'N$  and  $98^{\circ}29'E$  to  $98^{\circ}39'E$ ). It is a biosphere reserve located on the coast of the Andaman Sea, 568 kilometers south of Bangkok. Ranong encompasses an area of 3,298 square kilometers. Three districts and 2 sites within each district were selected based on accessibility, size of mangrove patches, and associated elements such as channels and distance. These districts were Mueng (Ngaw [1] and Rachakrud [2]), Kapoe (Bangben [3] and Banghin [4]), and Suk Samran (Talaynog [5] and Hadsaykaow [6]) (Figure 1).

The coordinates of each sampling site were recorded using a Global Positioning System (GPS) and the localities were validated and checked using georeferencing technique (Doydee, 2005; Bantayan, 2006). Remotely sensed data (Landsat-5 TM) with False Color Composite (FCC) image was used to determine the distribution of mangrove patches. The geospatial method was employed to overlay the spatial data on the FCC image. The Point Centered Quarter (PCQ) method of Mueller-Dombois and Ellenberg (1974) was used to inventory the mangrove trees species and to determine its dominant species in the collection sites.

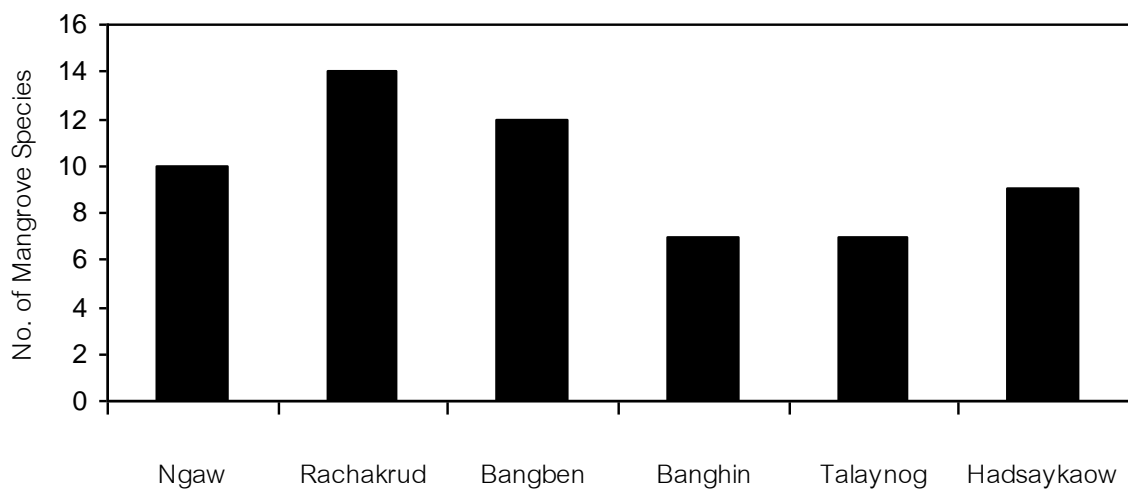
## Results

Table 1 presents species abundance (% stand) of mangrove vegetation in 6 study sites. *Rhizophora apiculata* was the most dominant compared with other mangrove trees species due to the highest percentage stand (66.25) found in Ngaw A. There were a total of 19 species of identified mangrove flora (Table 1). The highest species richness of the mangrove trees was in Rachakrud site with 14 species and the lowest was in Banghin and Talaynog sites with only 7 species each (Figure 2).



**Figure 1** The 6 study sites in the Ranong coastal zone: Mueng (Ngaw [1] and Rachakrud [2]), Kapoe (Bangben [3] and Banghin [4]) and Suk Samran (Talainog [5] and Hadsaykaow [6]).

There were 7 dominant species namely: *Rhizophora apiculata*, *R. mucronata*, *Avicennia marina*, *A. officinalis*, *Ceriops decandra*, *C. tagal* and *Bruguiera paviflora* as indicated in a square box of mangrove trees species list in Table 1.



**Figure 2** The species richness of mangrove trees species in the Ranong coastal zone.

**Table 1** Species abundance (% stand) of mangrove forest vegetation in 6 study sites in Ranong coastal zone.

Name of species (Family)	Mangrove Forest Site												
	Ngaw		Rachakrud		Bangben		Banghin		Talaynog		Hadsaykaow		
	A*	B	A	B	A	B	A	B	A	B	A	B	
<i>Aegiceras corniculatum</i> (Myrsinaceae)	1.25			3.75									
<i>Avicennia alba</i> (Avicenniaceae)			1.25	6.25									
<i>Avicennia marina</i> (Avicenniaceae)			37.50	21.25	1.25	8.75							
<i>Avicennia officinalis</i> (Avicenniaceae)	3.75	5.00	1.25	30.00					8.75	7.50	3.75	2.50	
<i>Bruguiera cylindrica</i> (Rhizophoraceae)	6.25	2.50	3.75	2.50		1.25	1.25						2.50
<i>Bruguiera gymnorhiza</i> (Rhizophoraceae)			1.25										
<i>Bruguiera parviflora</i> (Rhizophoraceae)	10.00	21.25	20.00	12.50		3.75	28.75	1.25	43.75	28.75	16.25	6.25	
<i>Ceriops decandra</i> (Rhizophoraceae)	2.50	8.75			40.00	40.00						1.25	1.25
<i>Ceriops tagal</i> (Rhizophoraceae)	1.25	3.75					28.75	10.00	8.75	6.25	1.25		
<i>Excoecaria agallocha</i> (Euphorbiaceae)				1.25	2.50	1.25							
<i>Heritiera littoralis</i> (Sterculiaceae)					1.25								
<i>Lumnitzera littorea</i> (Combretaceae)				1.25	2.50								
<i>Lumnitzera racemosa</i> (Combretaceae)					8.75								
<i>Rhizophora apiculata</i> (Rhizophoraceae)	66.25	46.25	26.25	7.50	28.75	37.50	26.25	47.50	15.00	21.25	37.50	65.00	
<i>Rhizophora mucronata</i> (Rhizophoraceae)		6.25	1.25			3.75	1.25	13.75	21.25	36.25	36.25	21.25	
<i>Scyphiphora hydrophyllacea</i> (Rubiaceae)					10.00								
<i>Sonneratia alba</i> (Sonneratiaceae)			2.50	7.50			2.50	12.50					
<i>Xylocarpus granatum</i> (Meliaceae)	8.75		1.25	6.25	5.00	3.75	11.25	15.00	1.25				1.25
<i>Xylocarpus moluccensis</i> (Meliaceae)		5.00	3.75						1.25		3.75		

\*A =PCQ perpendicular to the channel

B =PCQ parallel with the channel

## Discussion

Mangrove fragmentation over time results to the loss of habitat and this affects ecological processes and the composition of the mangrove fauna as observed in Banten Bay, West Java Island, Indonesia (Doydee and Siregar, 2006). Mangrove patch restoration option is crucial for coastal protection. The failure to adequately regulate coastal development and the rush to transform coastal areas into economic zones without considering their natural character are major factors contributing to human loss and damage to property. This is evident in the aftermath of tsunami in December 2004.

The reforestation and rehabilitation in fragmented areas of Ranong coastal zone have to be started continuously using an advantage of dominant species as they are adapted to environmental conditions. Any effort in mangrove patch restoration project in the coastal landscape will not be successful if it is neglected by the local people. This is similar to the study of Chotthong and Aksornkoe (2007) which reported that the sustainability of the mangrove forest rehabilitation and management by community largely depends on the benefits that can be generated and the participation of local people.

If the local people can fully understand the significance of mangroves, then they shall be more than willing to take part in the conservation efforts. This will lead to an increase in the sustainability of the Ranong mangrove forest. Therefore, the local people need to be better informed about the mangroves, its resources and its ecological and economic benefits. They should be aware of the beneficial and destructive activities in the mangrove landscape (Macintosh *et al.*, 2002). The local government units (LGUs) and external agency may provide financial support, seedlings and training, issuance of rules and regulations, and determination of the sustainable mangrove ecosystem management strategy.

## Summary

The mangroves in Ranong are needed in restoring by adapting the concept of mangroves native trees species. That is why; the mangrove trees species and its dominant species were studied for this initiated work. The study found some important evidences such as there were a total of 19 mangrove trees species in the study sites. There were 7 dominant species namely: *Rhizophora apiculata*, *R. mucronata*, *Avicennia marina*, *A. officinalis*, *Ceriops decandra*, *C. tagal* and *Bruguiera paviflora*. Those species were recommended for planting in Ranong coastal zone to increase the biodiversity habitats. However, the community-based resources management (CBRM) is necessary in order to success the task. When the mangroves are resuscitated this can enhance the quality of coastal environment and local people. This paper can be served as baseline information for related research in the future.

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